

# Exposure to Environmental Tobacco Smoke and Cognitive Abilities Among US Children and Adolescents

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Running Title: ETS Exposure and Child Cognition

Key Words: children, environmental tobacco smoke, environment, epidemiology, cognition

Abbreviations:

ETS – environmental tobacco smoke

SIDS – sudden infant death syndrome

NHANES III – Third National Health and Nutrition Examination Survey

WRAT-R – Wide Range Achievement Test-Revised

WISC III – Wechsler Intelligence Scale for Children III

NCHS - National Center for Health Statistics

Section Outline:

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## ABSTRACT

We used the Third National Health and Nutrition Examination Survey (NHANES III), conducted from 1988 to 1994, to investigate the relationship between environmental tobacco smoke exposure (ETS) and cognitive abilities among US children and adolescents aged 6 to 16 years. Serum cotinine was used as a biomarker of ETS exposure. Children were included in the sample if their serum cotinine levels were  $\leq 15$  ng/ml, a level consistent with ETS exposure, and if they denied using any tobacco products in the previous 5 days. Cognitive and academic abilities were assessed using the Reading and Math subtests of the Wide Range Achievement Test-Revised and the Block Design and Digit Span subtests of the Wechsler Intelligence Scales for Children-III. Analyses were conducted using SUDAAN software. Of the 5365 6-16 year olds included in NHANES-III, 4399 (82%) were included in this analysis. The geometric mean serum cotinine level was 0.23 ng/ml (range 0.035 – 15 ng/ml); 80% of subjects had levels  $< 1$  ng/ml. After adjustment for gender, race, region, poverty, parent education and marital status, ferritin, and blood lead concentration, there was a significant inverse relationship between serum cotinine and scores on reading ( $\beta = -2.69$ ,  $p = 0.001$ ), math ( $\beta = -1.93$ ,  $p = 0.01$ ), and block design ( $\beta = -0.55$ ,  $p < 0.001$ ), but not digit span ( $\beta = -.08$ ,  $p = 0.52$ ). The estimated ETS-associated decrement in cognitive test scores was greater at lower cotinine levels. A log-linear analysis was selected as the best fit to characterize the increased slope in cognitive deficits at lower levels of exposure. These data, which indicate an inverse association between ETS exposure and cognitive deficits among children even at extremely low levels of exposure, support policy to further restrict children's exposure.

